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ABSTRACT

This paper examines several recent lines of research concerning category clustering and describes an alternative to the standard category clustering procedure used to study recall organization in younger children. The specific issue considered is the age at which children first show evidence of spontaneous category clustering in their free-recall. Possible interpretations of the contrasting results presented in the literature focus on the types of organizational behaviors measured by the clustering index: (1) associative modes, or (2) conceptual modes. Examples from research are presented to illustrate the distinction between associative and conceptual clustering. It is concluded that there is no way to distinguish associative from conceptual modes of spontaneous organization at any age level when using traditional measures of clustering. An alternative clustering measure, which employs a sorting-recall procedure, is proposed and described. Results of using this procedure, which differ on several dimensions with previous results, are reported. The advantages of using this sorting-recall procedure include: (1) the determination of particularly meaningful age trends; (2) the provision of important information about the qualities of organizational processing; and (3) the opportunity to determine the category basis and criteria used in grouping items. (SDH)

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Category Organization in Children's Recall: A Critique of Past and Present Research[1]

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CATEGORY ORGANIZATION IN CHILDREN'S RECALL: A CRITIQUE OF PAST AND PRESENT RESEARCH

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Since Bousfield's original research on category clustering in the recall of adult subjects (1953) numerous developmental investigations have been undertaken to examine children's abilities to organize their free-recall according to the categorical properties of presented materials. Much of this developmental research has proceeded along the lines of the standard category clustering paradigm developed by Bousfield. Typically, children of various ages have been asked to view experimenter-defined sets of taxonomically-related words or pictures, usually presented in random order, and then later to recall these items from memory on a single trial of free-recall. An index of recall clustering serves to quantify the degree to which instances of the same taxonomic categories are recalled adjacent to one another in the subject's output list. The more a subject structures his recall according to the category structure built into the list by the experimenter the greater the subject's organization score. One purpose of this paper is to examine several recurrently appearing lines of category clustering research with children that have produced questionable developmental interpretations of children's conceptual capabilities to use categories in organizing free-recall. A second purpose of the paper is to describe an alternative to the standard category clustering procedure that would appear to be more appropriate, as well as more informative, as a means to study recall organization in younger children.

The first issue to be considered here concerns the age at which children first show evidence of spontaneous category clustering in their free-recall. This question has important implications for cognitive-developmental theory, and for this reason has received widespread attention in previous developmental research. Nevertheless, there are marked discrepancies among findings related to the age of onset of spontaneous clustering that are unlikely to be clarified by discussions of minor differences in the procedures and sampling techniques used in the different studies. Some investigators present evidence that children as young as two-to-five years show above-chance levels of clustering in their free-recall (Rossi, 1964; Rossi & Rossi, 1965; Vaughan, 1968; Moely, Olson, Halwes & Flavell, 1969). Other investigators provide equally convincing evidence that clustering first becomes evident in children eight-to-ten years of age or older (Cole, Gay, Glick & Sharp, 1971; Lange, 1973; Furth & Milgram, 1973).

One feasible interpretation of these contrasting results focuses on the types of organizational behaviors measured by the clustering index. Some writers argue, or at least implicitly assume, that for clustering to occur subjects must actively organize and retrieve stimulus input according to a self-discovered set of category symbols implicit in the stimulus array. Along this line of reasoning Jensen (1968) refers to free-recall clustering as "one of the clearest forms of conceptual, hierarchical process." The fact remains, however, that presented items that belong to the same conceptual categories also have greater inter-item semantic relatedness than items belonging to different categories. Thus, same-category items are more likely to be recalled adjacent to one another as a result of associative elicitation even if subjects are not concentrating on the categorical properties of the items. In short, standard forms of the clustering index are equally as sensitive to associative modes of recall organization as they are to conceptual modes.

This issue is particularly significant when considering the findings of some of the earlier-mentioned studies in which above-chance levels of clustering are observed among preschoolers and young school age children. In these studies, investigators have not placed controls upon the associative relatedness of stimulus items, and in some cases investigators have presented items of the same conceptual categories that appear to be high-frequency associates. The Rossi study (1964), for example, included in the clothing category the items "hat", "coat", "dress", and "belt." Similarly, Vaughan (1968) included in the clothing category the items "hat", "coat", "skirt", and "sweater." Under these conditions it seems reasonable that observed clustering levels, particularly among younger children, may have been largely reflective of the children's reliance upon highly practiced word associations, and not indicative of tendencies to use higher-order conceptual skills in organizing recall.

This suspicion gains some empirical support from the fact that spontaneous clustering data summarized in these studies is shown to increase with age in a linear manner. Developmental evidence collected in other areas of cognitive study, particularly in the areas of paired-associate learning and concept attainment, suggest quite consistently that symbolic-conceptual behavior emerges in a relatively sudden manner -- and rarely before the child is six years of age. Some authors refer to this transition as a "cognitive shift." If observed recall clusteirng levels were truly indicative of higher-order conceptual activity among children at all age levels non linear age trends would be expected. On the other hand, if the younger subjects in these studies were organizing their recall according to conventional associative principles linear trends would be expected.

In a recent study, Lange (1973) has presented children in grades K, 5, and 9 with categorized items that were not considered to be highly related to one another on an associative basis. In this study the kindergarten and fifth-grade subjects displayed chance levels of spontaneous clustering, and had no

greater recall for items than their peers in a serial recall condition. At the ninth grade level, however, subjects displayed nearly half of the total amount of clustering possible. Thus, it appears that under conditions where the possibilities for associative responding are minimized younger children do not group items of the same E-defined taxonomic categories together during free-recall.

Studies of the effects of item- and category-labeling on clustering also yield indications that younger children do not, on their own initiative, focus on the categorical properties of stimuli when organizing free-recall. Were it the case that younger subjects would employ conceptual organizing strategies if only they could discover the appropriate category symbols, then labeling procedures would be expected to facilitate clustering performance. Contrary to this hypothesis, most all of the related research indicates that labeling has little, if any, facilitating effect on spontaneous clustering in younger children. This finding has been reported by Horowitz (1969), Moely et al. (1969), Cole et al. (1971), Lange (1973), and Furth & Milgram (1973). In discussing their results, Furth & Milgram state that "the most pronounced organizing effects of labeling on free-recall were found in the older rather than the younger children and to a greater extent in stimulus conditions that were more conducive to categorization." Similarly, Horowitz and Moely et al. indicate that their labeling conditions were only effective for children eight years of age or older. From these findings, coupled with evidence discussed earlier, it can be argued that preschoolers and young school age children have no cognizance of organizing their materials according to the experimenter's conceptual criteria and for this reason ignore conceptual cues given in labeling conditions as irrelevant dimensions of information.

Maybe I have belabored the distinction between associative and conceptual clustering as preferential modes of stimulus organization. This issue was raised by Bousfield and his associates (Bousfield, Steward, & Cowan, 1964) in some of their early research, and has since been discussed by a number of investigators

in conjunction with research on organized memory in adults (see Cofer, 1966, and Shuell, 1969, for reviews of this literature). My reason for re-stating the issue in the context of child memory study is to emphasize that we are severely limited in formulating a developmental theory of meaningful memory organization to the degree that we remain uncertain as to the quality of cognitive process reflected at various age levels by standard measures of spontaneous recall organization. Although I have implied that organization according to conventional associative principles may account for greater-than-chance levels of clustering when observed among younger children, the fact of the matter is that there is no way to distinguish associative from conceptual modes of spontaneous organization at any age level when using traditional measures of clustering.

To the degree that school age children do focus on self-discovered superordinate categories when organizing free-recall, the standard category clustering procedure suffers from another fundamental weakness. Since the clustering index is derived in reference to adult-specified taxonomic criteria it would seem to be differentially sensitive in measuring preferred categorizing schemes of children at different age levels. Studies by Annett (1959), Goldman & Levine (1963), Saltz and his associates (1967, 1972), Lange & Hultsch (1970), and Liberty & Ornstein (1973) provide ample evidence that the sorting categories of younger children are smaller, more fragmented, and often constructed with different items, different sorting criteria, and presumably different conceptual properties than those of older children and adults. Thus, it can be argued that younger children make poorer approximations to E-defined category schemes than older children, and therefore receive clustering scores that underestimate their organizing accomplishments.

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In an attempt to overcome this limitation Lange & Jackson (1974) have employed a sorting-recall procedure in which clustering in free-recall is analyzed in reference to personal sorting categories established by subjects during an

initial free-sorting task. Although the pictorial stimuli used in this study could be classified, by adult standards, as instances of several broadly defined taxonomic categories, a principle selection requirement was that the items be easily classifiable both within and across the categories by children. A minor modification of Robinson's Item Clustering Index (1966) enabled this to be a suitable measure of personal category organization. An additional feature of the procedure was to require subjects to verbalize a rationale for each of their sorts during the initial free-sorting trials. In this way information could be collected concerning the types of sorting criteria used by children at different age levels, and the degree to which children employed superordination in forming categories.

The results of the study differ from those of previous clustering investigations on several dimensions. For example, it was found that even the youngest of the subjects (first graders) made substantial reference to their sorting schemes in the subsequent period of free-recall. These subjects clustered nearly half of the total number of potentially clusterable pairs, and fourth graders clustered nearly 60% of the total amount possible. These clustering levels are considerably higher than Item Clustering Index means reported for same-age children in studies where E-defined categories have been used as the basis for clustering (Appel, Cooper, McCarrell, Sims-Knight, Yussen, & Flavell, 1972; Lange, 1973). Also, there were indications in the Lange & Jackson study that personal schemes of item organization appearing in free-recall served to mediate the recall achievements of school children at all age levels. Correlations between personal clustering scores and amount of recall ranged from +.69 at grade I to +.80 for the college sample. Previously, there has been little, if any, support for the hypothesis that age-related increases in recall are mediated by improved spontaneous category organization. Liberty & Ornstein (1973) employed a similar procedure in which college students and fourth graders were given alternating sort and recall trials in a

multi-trial free-recall task. Although these investigators found no evidence that fourth graders clustered recall according to the categories they had established on sorting trials, only three of the 32 free-sorting fourth graders were able to achieve stable sorting schemes within the maximum limit of six sorting-recall trials. Mandler (1967) and Mandler & Stephens (1967) have emphasized that relationships between organization and recall are most likely to be found when recall follows the subjects' attainment of stable category systems.

Some advantages of using the sorting-recall procedure are as follows: First of all, age trends derived with this procedure are particularly meaningful not only because clustering is analyzed in reference to the subject's preferred schemes of category organization, but also because subjects at all age levels are given ample opportunity to arrive at stable category schemes prior to recall -- a procedure that would seem to equate age groups on the extent to which study organization occurs. Secondly, requiring subjects to verbalize their sorting criteria provides rich information about the qualities of organizational processing. For example, superordination can be examined by coding categories as to whether all of the included items are related to the same conceptual referent (or single category instance), or whether the basis for item inclusion varies for different items. Also, with this sorting proceudre it can be determined whether subjects are categorizing items on the basis of descriptive, functional, categorical, or other types of stimuli relationships, and how consistently the various types of criteria are used throughout the subject's category system.

In short, although the sorting-recall procedure is relatively demanding of the investigator's time and energy, it serves to circumvent the most critical deficiencies of the standard category clustering procedure, and appears particularly fruitful for the future study of meaningful memory organization in younger children.

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